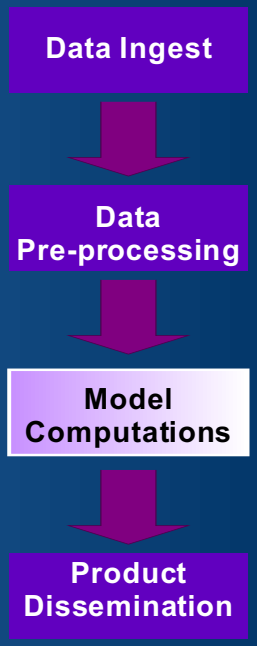
Ensemble Forecasting System

ESP, ESPINIT, ESPADP, and a few others

ESPINIT

Purpose

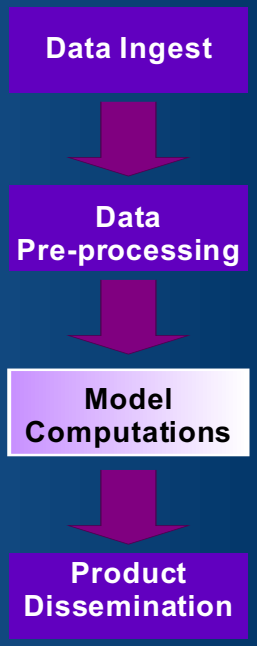
- The regular operational forecast runs gather data from the operational fs5files.
- In order to run ESP we need to gather data from alternate sources.
- The ESPINIT function redirects the data reading routines to alternate time series.



ESPINIT

Time Series Types and File Types

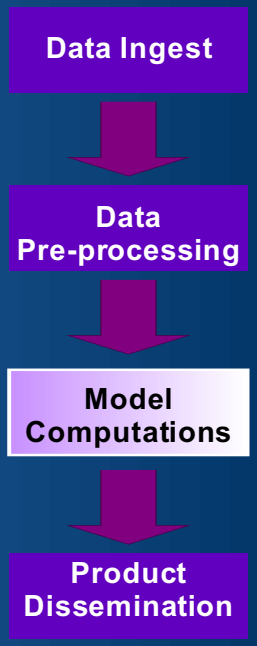
- Time Series types are the same as in FCINIT.
  - INPUT
  - OUTPUT
  - UPDATE
  - INTERNAL
- But the file types are different:
  - CARD
  - GENR
  - ESP
  - MSNG
  - REPL



ESPINIT

File Types

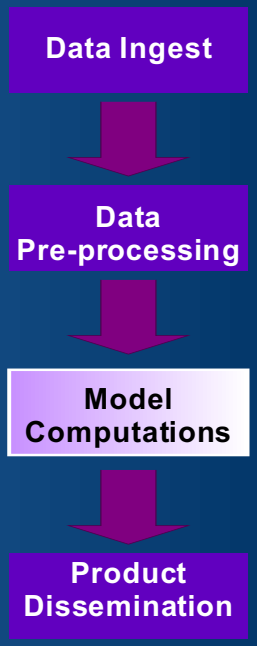
- CARD
  - Calibration time series.
    ASCII files that are stored in RFC selected directories. Identified with the $(calb_area_ts_dir) token and a path/filename.
    – Used with the INPUT Time Series Type
- GENR
  - A special file type that is used to create either blended MAP/MAT time series or to create P.E. time series.
    – Used with the INPUT Time Series Types



ESPINIT

File Types, continued

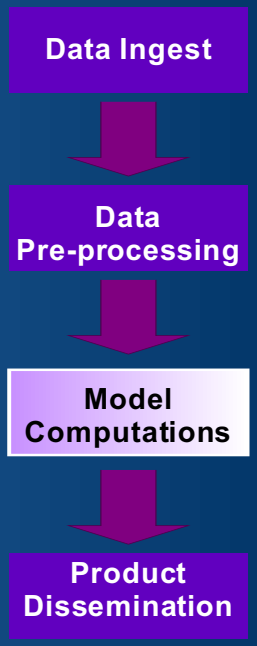
- ESP
  - Binary files stored in the $(espts_dir). Used to pass flows downstream during an ESP run and to store the ensembles used in ESPADP.
    - Used with the INPUT or OUTPUT Time Series types.
- MSNG
  - Used to indicate a particular time series is missing.
    - Used with the INPUT Time Series type.



ESPINIT

File Types, continued

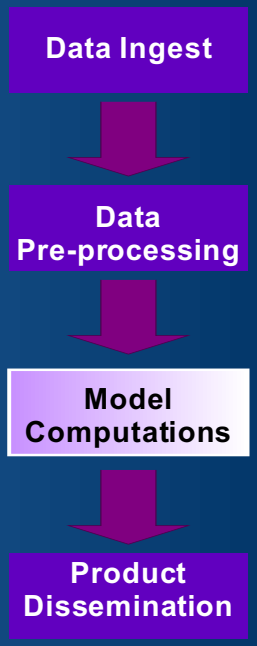
- REPL
  - Another special File type. It is used to replace QIN Time Series with QME Time Series. Obsolete for the most part now.



ESPINIT

Special Note About ESPINIT

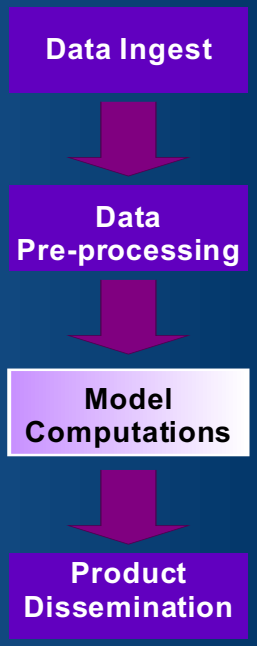
- The first line of ALL ESPINIT input decks must be a header line.
  - The header can be blank.
  - Or it can be characters
  - It is not used for anything
  - It is there because of some debug options.



ESPINIT and FCINIT

Current System and Enhanced Version

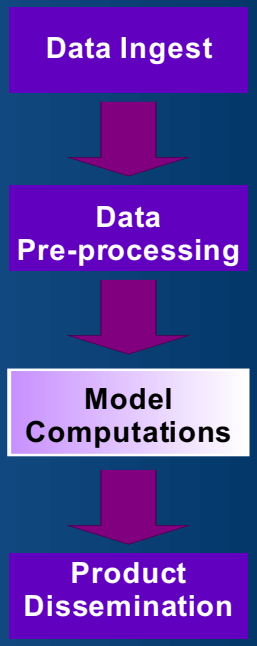
- Current System
  - Users must redefine Time Series in ESPINIT when they redefine Time Series in FCINIT
- Enhanced Version
  - The ESPINIT Time Series definition will be moved into FCINIT.



ESP

ESP is a Function in the FCST Program

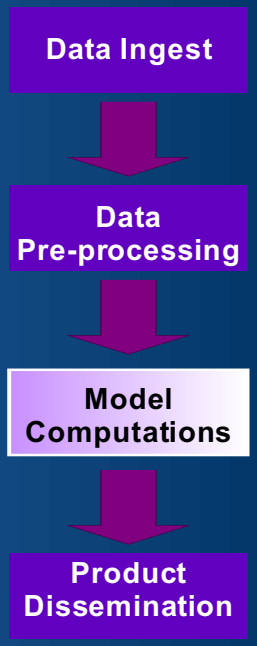
- The ESP function computes an ensemble of time series and can do statistical analyses.
- ESP is controlled by Techniques, just as other FCST Functions are controlled.
- ESP control input files are placed in the FCST input directory.



ESP

ESP is Just an FCST Function

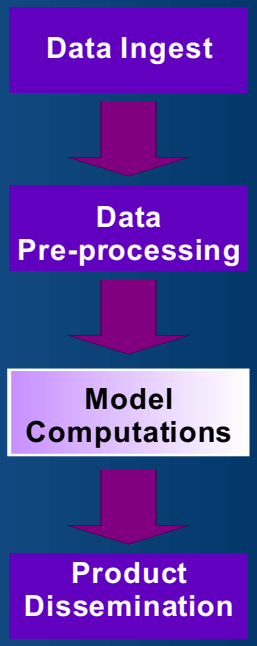
- ESP diagnostic output goes to your ofs output directory.
- ESP time series output is written to the $(espts_dir)
- ESP batch analysis output is in the diagnostic output.



ESP

Techniques to Control ESP

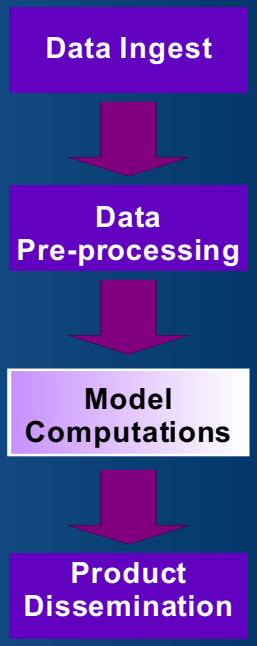
- STARTESP
  - sets the start of the run
- WINDOWS
  - used to set the end of the run
- HISTWYRS
  - ESP assumes that all ensemble members are related to historical water years, not calendar years
- CGROUP, FGROUP and ONESEG
  - beware the ESP time shifting when using ONESEG



ESP

More Techniques to Control ESP

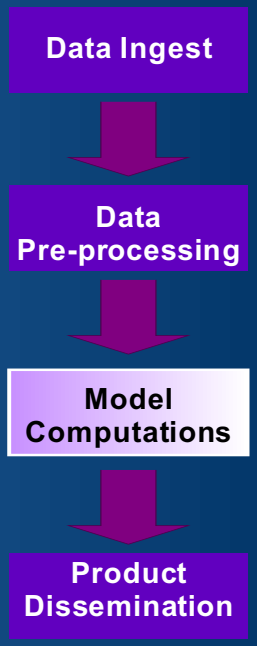
- HISTSIM
  - to run ESP in the historical simulation mode
- PERMWRIT
  - should always be on if you are using ESPADP
- ESPINDIR, ESPOTDIR
  - specifies subdirectories below the $(espts_dir) for input and output flow time series
- REGULATE
  - Turns reservoirs on and off
- Various Techniques control blending parameters



ESP

ESP Time Shifting

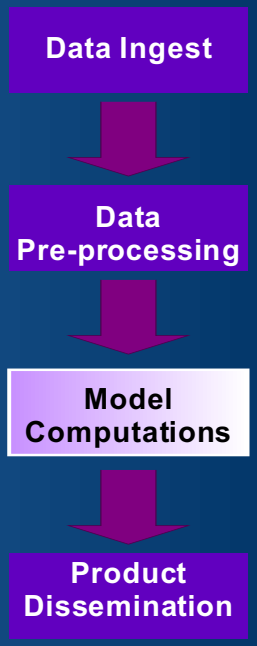
- ESP runs in Local Standard Time (LST) because that is the time zone of the historical data.
- The rest of OFS runs in Z time. (Really NWSRFS internal time, but ....)
- In order to run ESP, either the carryover time has to be moved, or all the input data has to be interpolated to Z time.
  - The simpler solution was chosen, the carryover date is shifted.
- The shift depends on the Minimum Computational period of the segment or segments being run.



ESP

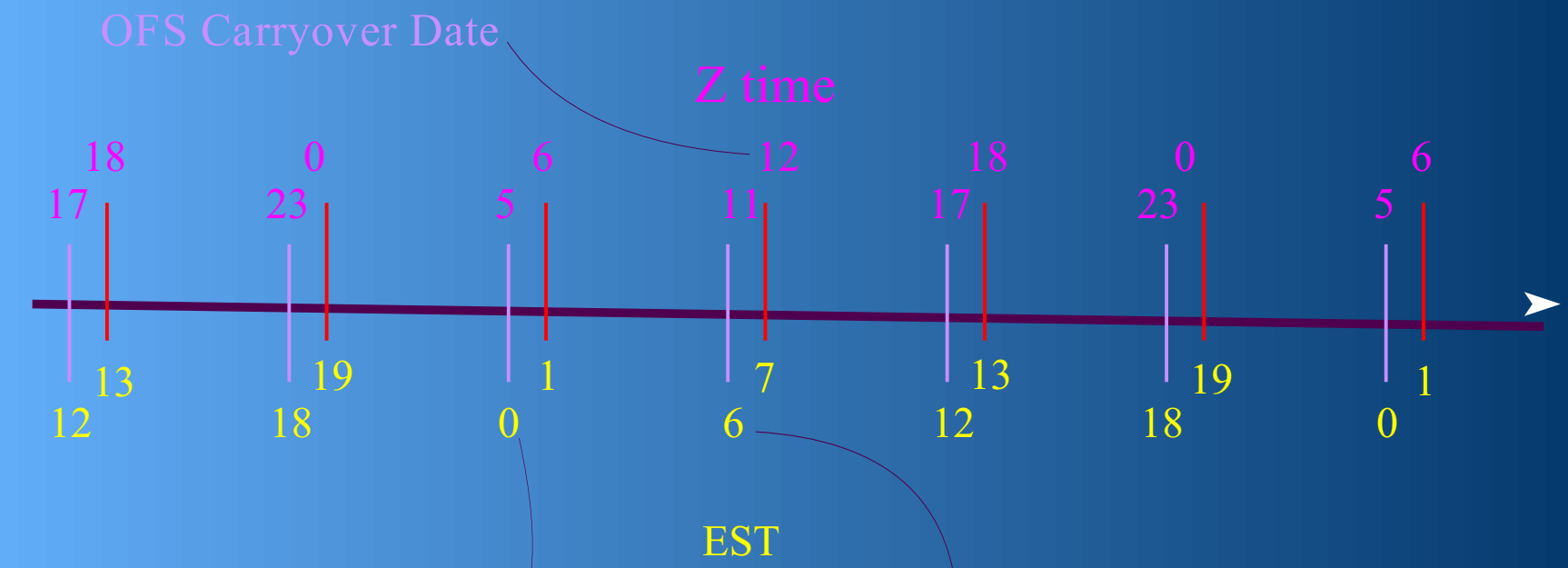
The Infamous ESP Time Shift

- All segments have a Minimum Computational Period
  - Every operation has a Minimum Computational Period.
    - RES-SNGL has a minimum of 24 hours.
  - The Minimum Computational Period is NOT the same as the execution time step.
- And FGROUPs, CGROUPs and SPECIALFGs all have Minimum Computational Periods too.
- Multiple ONESEG runs vs. SPECIALFG run of same segments.



ESP

That Time Shift



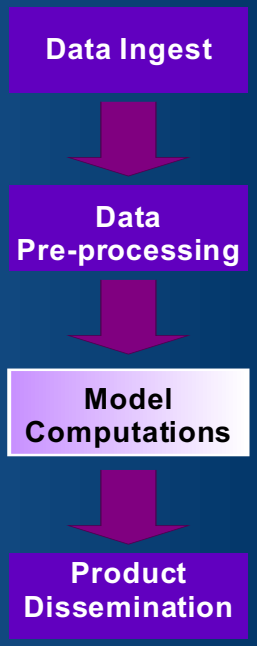
If min period equals 24, shift to here.

If min period equals 6, shift to here.

ESP

And Yet More About That Time Shift

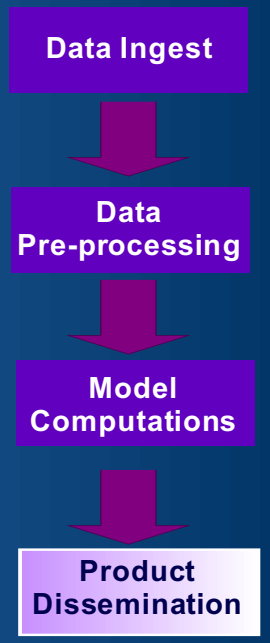
- FCINIT prints out the Minimum Computational Period for a segment when it is defined.
- ESP prints out how the carryover date has been shifted.
- For the short term ensemble forecasting projects, we reset LST, and the carryover does not get shifted.



ESPADP

Computing the Statistics

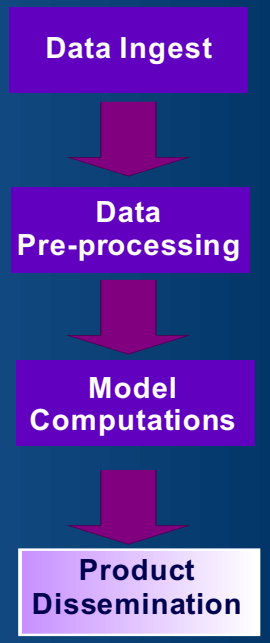
- ESPADP reads time series from the $(espts_dir).
- Time series must be named for a defined segment.
- Copy (or link) observed time series to the $(espts_dir) to get them to display.
  - Must be named identically to the simulated time series of interest, except for the extension.
  - Must have identical time step, data attributes as the simulated time series.
    - Cannot link 6 hr and 24 hr time series.



ESPADP

Extracting Information

- Can dump out GIF, PS, ASCII tables or the time series from ESPADP.
  - Both interactively and through batch.
- To dump out GIF images you must have an open X display, even in batch mode.
  - Or export the display to an open X display.
  - Does not work through Exceed.
- Can also analyze any CARD time series in ESPADP.
- -nomap option



PRE and POST Processors

New and Always Improving

- ENS_POST_CP
  - Post Processor Calibration program
    - Needs historical simulation and observations
- Post Processor
  - Also called the Error Model
  - Part of ESPADP
- ENS_PRE_CP
  - Pre Processor Calibration program
    - Needs historical observed MAP/MAT
- Pre Processor
  - Also called PREADJUST